

 Eskom	SOW	Camden Power Station
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Compiled by



N. Naidu

Auxiliary Plant System Engineer

Date: 25/04/2022

Supported by



O. Tilodi

Auxiliary Plant Engineering Manager

Date: 2022/04/26

Functional Responsibility



N. Ngobese

Chemical Services Manager

Date: 2022/04/26

Authorized by



p.p

M. Mathabatha

Engineering Manager

Date: 26/04/2022

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1. Introduction

The production of demineralised water with prescribed quality is critical to the optimum generation of power in the turbines. Demin water is produced when all dissolved solids are removed from the water. These solids, in the form of cations and anions, are removed in the Cation, Anion and Mixed Bed Vessels (i.e. a demin train) by the use of ion exchange resin through a process called demineralisation. Functional life of the resin is determined by the volume of water treated. A demin train should be able to treat approximately 4000 m³ of water before the train needs to be regenerated. As the resin ages the volume of water treated before a regeneration is required decreases. This is an indication that the resin has reached its end of life and should be replaced.

2. Supporting Clauses

2.1 Scope

2.1.1 Purpose

The purpose of this project is to replace the Cation, Anion and Mixed Bed resin at the Water Treatment Plant (WTP) which has reached the end of its functional life.

2.1.2 Applicability

- Relevant Contractor
- Auxiliary Plant Engineering
- Chemical Services

2.1.3 Effective date

See date of authorized signature

2.1.4 Normative References

- Occupational Health and Safety Act (OHS), Act 85 of 1993

2.1.5 Informative References

N/A

2.2 Definitions

N/A

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2.3 Abbreviations

CFR	Co-flow regeneration
Demin	Demineralised
NDT	Non Destructive Test
PPE	Personal Protective Equipment
SAC	Strong Acid Cation
SBA	Strong Base Anion
SDS	Safety Data Sheet
TDS	Technical Data Sheet
WTP	Water Treatment Plant

2.4 Process for Monitoring

N/A

2.5 Related/Supporting Documents

N/A

3. Scope of Work

The following scope of work shall involve the full spectrum of work required to supply and deliver resin required for the three Cation, three Anion and three Mixed Bed vessels at Camden Power Station.

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3.1 Contractor Responsibilities:

The Contractor will be responsible for all necessary labour, tools and equipment required for the following:

- Supply and deliver ion exchange resin for demineralisation plant. The demineralisation plant resin selected or supplied must be able to match or better the current expected plant throughput performance. The supplier is required to provide a computer simulation output that demonstrates the performance of the selected resin. The selection of the resin shall be on the evaluation of the computer simulation output provided by the supplier. The supplier shall use the information provided in Table 1 to conduct the simulation
- Provide batch numbers for all resin products delivered to Eskom, for traceability during troubleshooting
- All ion exchange resin products must be supplied in pallets of 25 litres bags amounting to 1000 litres
- All ion exchange resin products must be delivered in an open loaded truck to allow accessibility by the forklift during offloading
- Cation and anion resins used in demineralisation mixed bed must be designed to operate as pairs, to ensure good resin separation and minimise resin cross contamination
- The demineralisation mixed bed resin must have the following polymer matrix type:
 - Cation resins: a styrene gellular strongly acid resin
 - Anion resins: a styrene macroporous strongly basic type 1 resin
- The demineralisation mixed bed must have the following total exchange capacity and form:
 - Cation resins must be supplied in hydrogen form with capacity greater than 2.0 eq/l
 - Supply anion resins in the hydroxyl or chloride form with a capacity of greater than 1.0 eq/l
- Both cation and anion resins supplied must have perfect beads exceeding 99% and broken beads must be less than 1%
- The uniformity coefficient for both cation and anion resin must be less than 1.2. 90% of the resin beads must be in the range of 0.60 – 0.70 mm
- The safety data sheets (SDS) and technical data sheet (TDS) must be provided per product
- The following documents shall be submitted to power station personnel in the Water Treatment Plant Control Room upon arrival at the power station:
 - Ion exchange resin certificate of analysis and batch numbers
- Delivery note, which must include the order number, the name of the power station and the power station address

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4. Acceptance

N/A

5. Revisions

Date	Rev.	Compiler	Remarks
April 2022	1	N. Naidu	Original Issue

6. Development Team

- Pierre Leibbrandt
- Sidwell Muthavhine

7. Acknowledgements

N/A

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ANNEXURE A – CHEMISTRY AND PLANT DATA

Data for Computer Simulation

DATA			
Average Water Analysis (Cation inlet)		Units	
	Ca	ppm as CaCO ₃	19.6
	Mg	ppm as CaCO ₃	18.6
	Na	ppm	2.31
	K	ppm	3.23
	Cl	ppm	5.71
	SO ₄	ppm	13.5
	NO ₃	ppm	
	HCO ₃ or M-Alkalinity	ppm as CaCO ₃	41.9
	SiO ₂	ppm	1.82
	pH	Value	7.22
	Conductivity	µS/cm	125
	Organics (TOC)	ppm	2.4
Temperature		°C	Average 20°C
Flow Rate	Gross	m ³ /h	80
Number of lines		Number	3

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Cation Data for Computer Simulation

DATA			
		Units	
Regen Type	*CFR, RFR or T&B		CFR
Resin Type			SAC
Stratified bed		Y/N	No
Resin Volume per vessel	Cation (WAC)	L	0
	Cation (SAC)	L	6000
	Inert	L	0
Column Diameter		mm	2300
Cation Regeneration	H ₂ SO ₄ Concentration (used)	%	2 and 4
	H ₂ SO ₄ Concentration (storage)	%	98
Cation Outlet Expected Quality	pH		~3
	Sodium	ppb	200
Degasser		Y/N	Y
Number of Cation Vessels		Number	3

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Anion Data for Computer Simulation

DATA			
		Units	
Regen Type	*CFR, RFR or T&B		CFR
Resin Type			SBA
Stratified bed		Y/N	No
Resin Volume per vessel	Anion (WBA)	L	0
	Anion (SBA)	L	6000
	Inert	L	0
Column Diameter	WBA	mm	
	SBA	mm	2300
Anion Regeneration	NaOH Concentration (used)	%	4
	NaOH Concentration (storage)	%	48
Anion Outlet Expected Quality	Conductivity (SBA)	µS/cm	<10
	Silica	ppb	<200
Number of Anion Vessels		Number	3
Expected Throughput of the Demin Train		m ³	4500

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Mixed Bed Data for Computer Simulation

DATA			
		Units	
Resin Type			SAC
			SBA
Resin Volume per vessel	Cation (SAC)	L	1200
	Anion (SBA)	L	1200
Column Diameter	SAC/SBA	mm	1900
Regeneration	H ₂ SO ₄ Concentration (used)	%	4
	NaOH Concentration (used)	%	4
Number of Mixed Bed Vessels		Number	3
Expected Throughput per Train		m ³	
Mixed Bed Outlet Expected Quality	Turbidity	NTU	0.2
	Conductivity at 25°C	µS/cm	0.1
	Silica as SiO ₂	ppb	10
	Sodium as Na	ppb	2
	TOC as C	ppb	250
	Chloride as Cl ⁻	ppb	2
	Sulphate as SO ₄ ²⁻	ppb	2

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